Nebraska Water Funding Task Force

Producer Driven Outcomes

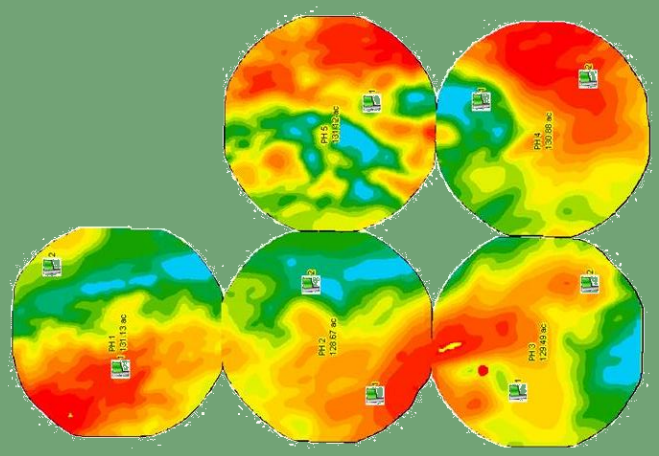
August 29th, 2013

Producer-Driven Outcomes

Using innovation to reduce water consumption and preserve production

Producer-Driven Outcomes

Innovative ways to increase production and reduce water consumption

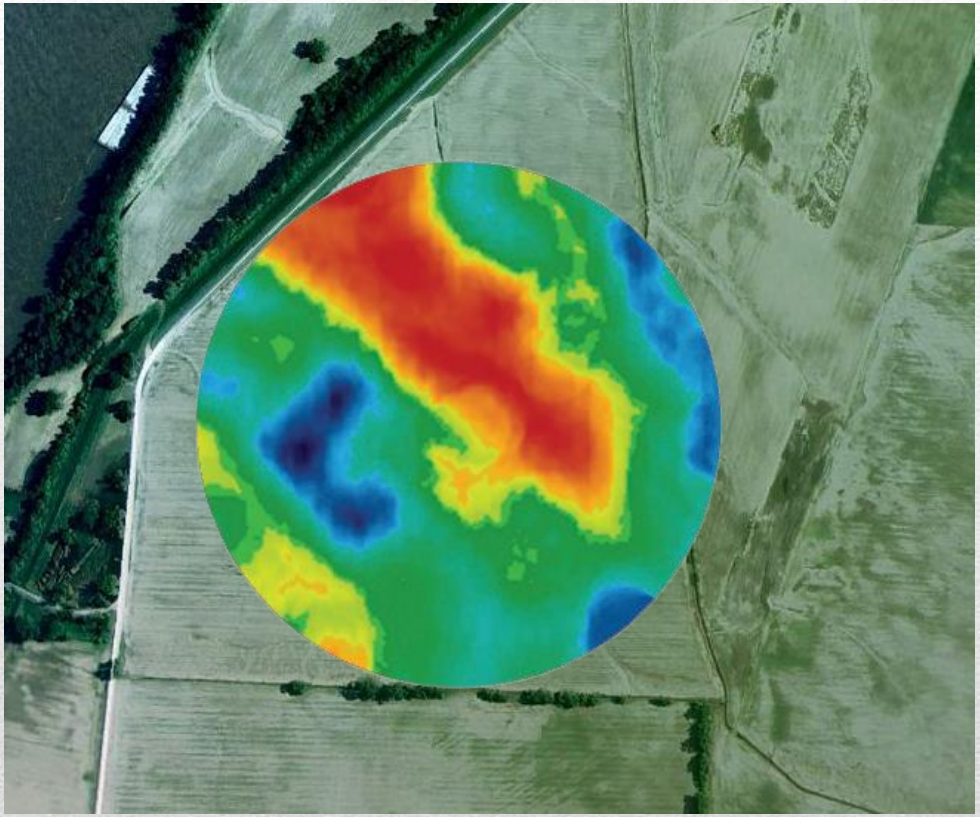


PRECISION AGRICULTURE

Using technology to manage variability within fields to optimize profits, resources and sustainability.

A Change in Focus

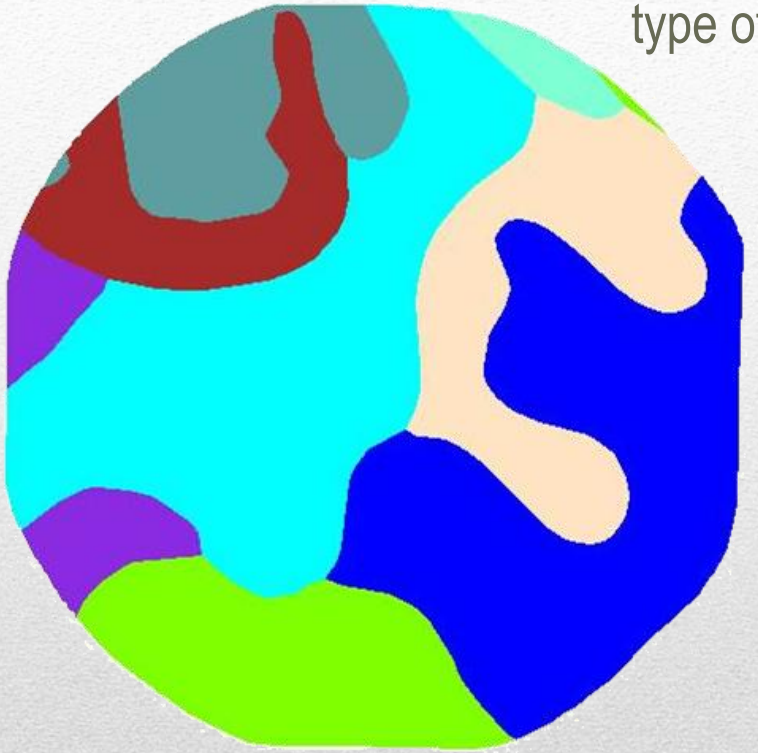
- From increasing yields on every acre of a field to….
- Maximizing production on acres with the most potential



Step 1: Map out the field

- Identify soils with similar capabilities

Each color represents a different type of soil.



SOURCE: NRCS Soil Survey.

Step 1: Map out the field

- Precision Soil Testing uses EC (Electrical Conductivity) to measure water holding capacity of different soils.

SOURCE: CropMetrics.

Step 1: Map out the field

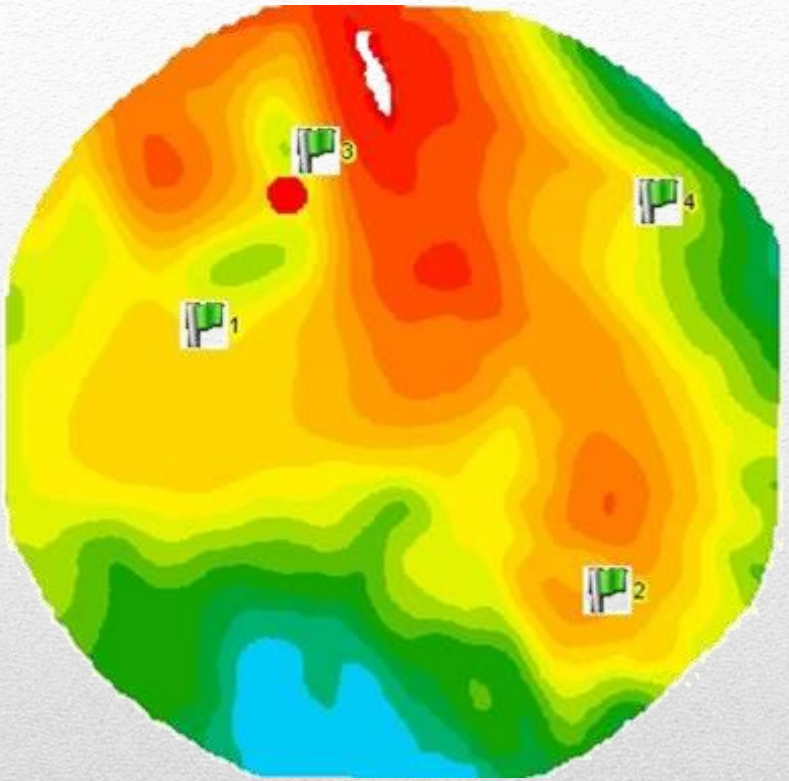
- Precision Maps: EC mapping using GPS technology provides more detailed soil maps.

NRCS Soil map

EC Soil map

Step 1: Map out the field

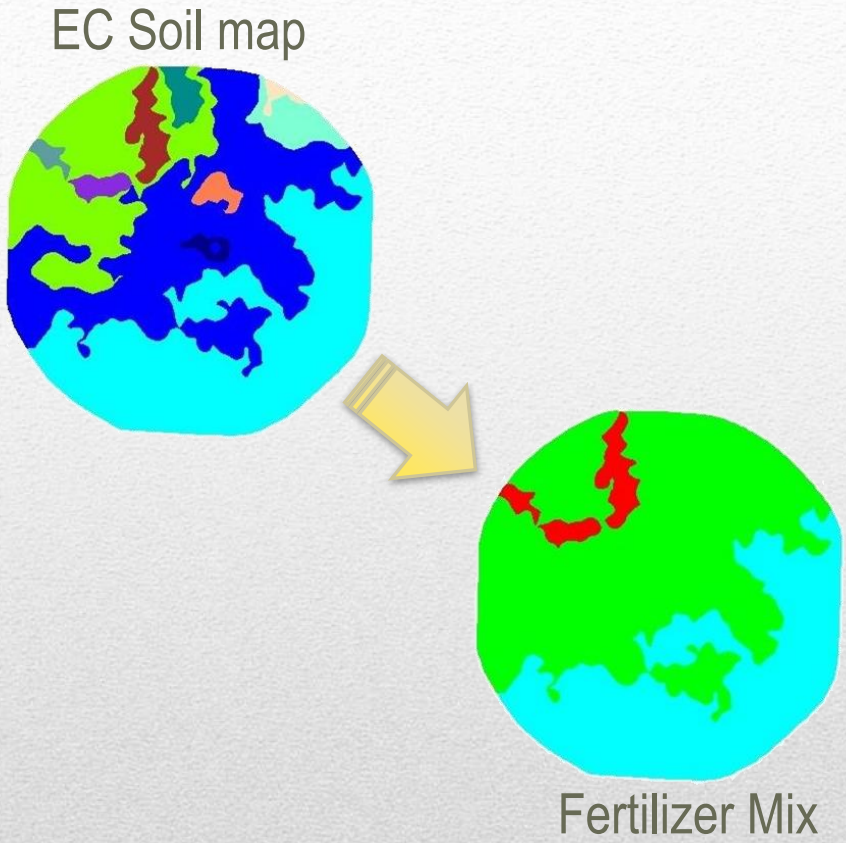
- Elevation maps provide useful information on slope



Red = Higher Elevation Blue = Lower Elevation

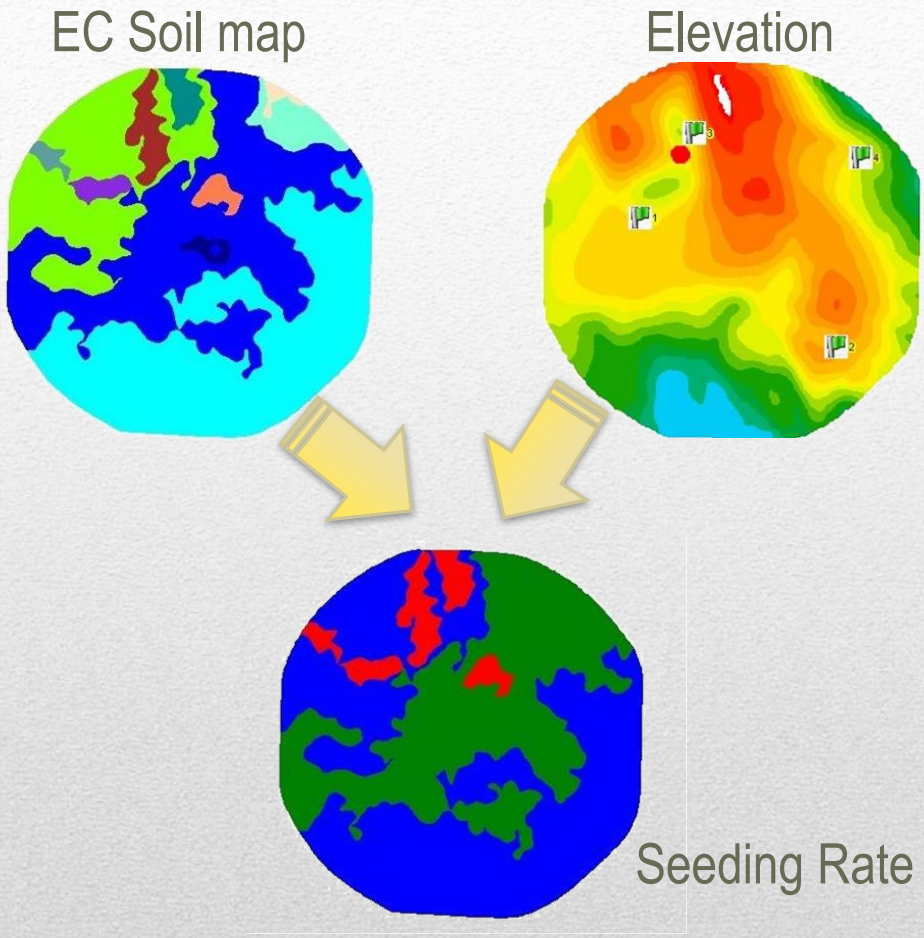
Step 2: Management Zones

- Similar soils are grouped into management zones for site specific management of:
  - Fertilizer



Step 2: Management Zones

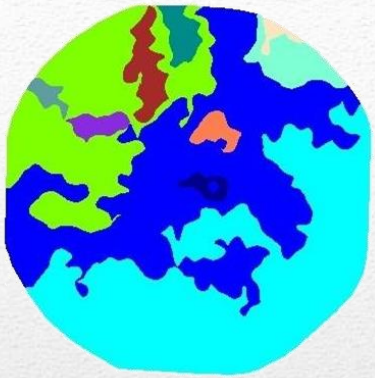
- Soil and elevation maps determine management zones for site specific management of:
  - Seeding rate

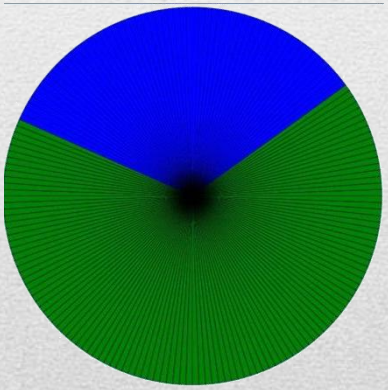


Step 2: Management Zones

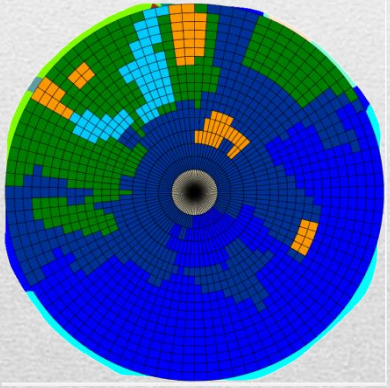
- EC or water holding capacity of the different soils determines variable rate irrigation plan using:
  - Speed Control
  - Zone Control

EC Soil map

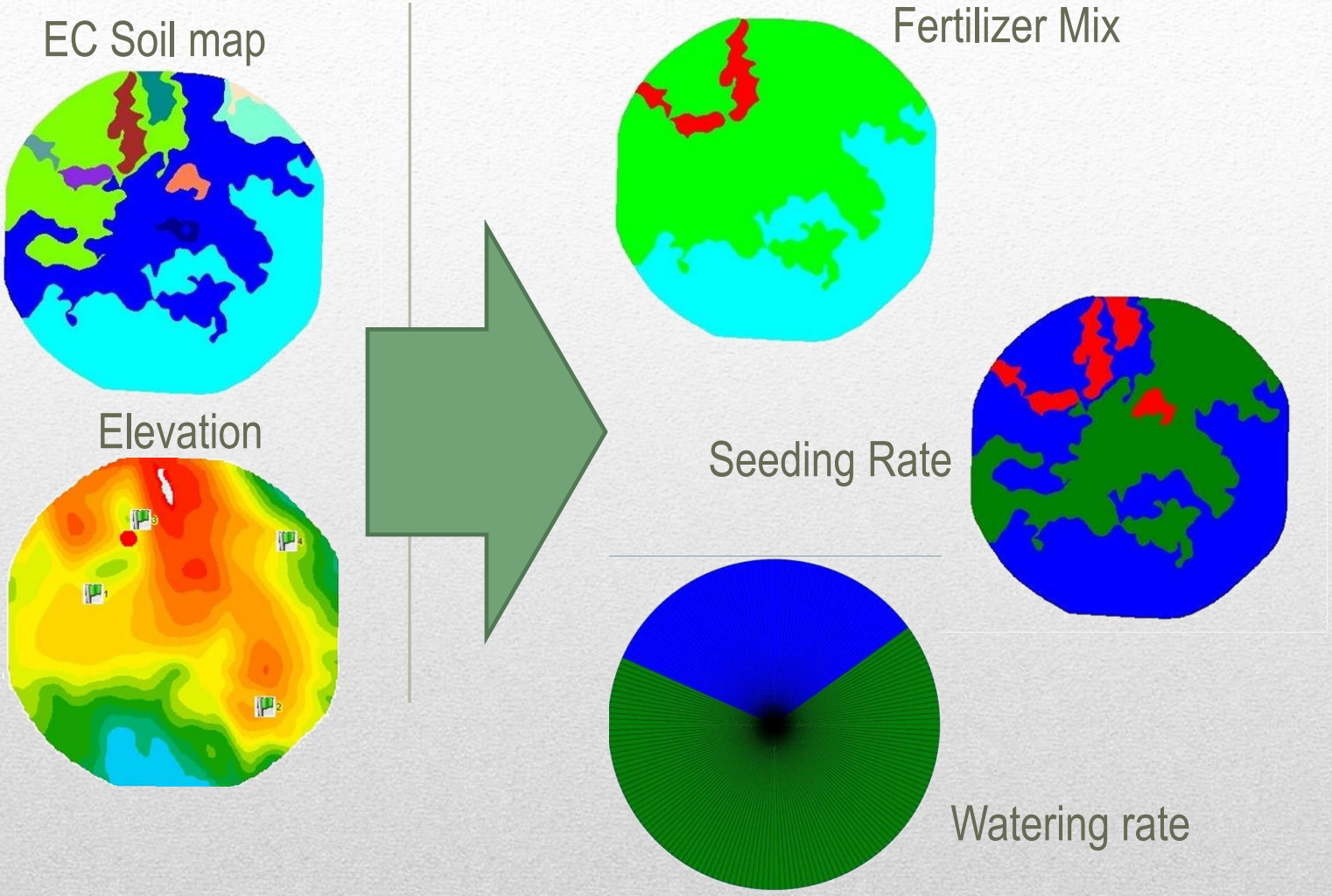




Speed Control



Zone Control



Step 3: Prescription for each field

Strip - Tillage

- Deep tillage to fracture compaction
- GPS/RTK systems for repeatable trip accuracy
- Precise fertilizer placement

Step 4: Implementation

Seeding

- Variable rate seeding and hybrid placement
- Precise repeatability of strip-till pass
- Logs seed variety and population rates
- Row command for no overlap or over seeding

Step 4: Implementation

Herbicide

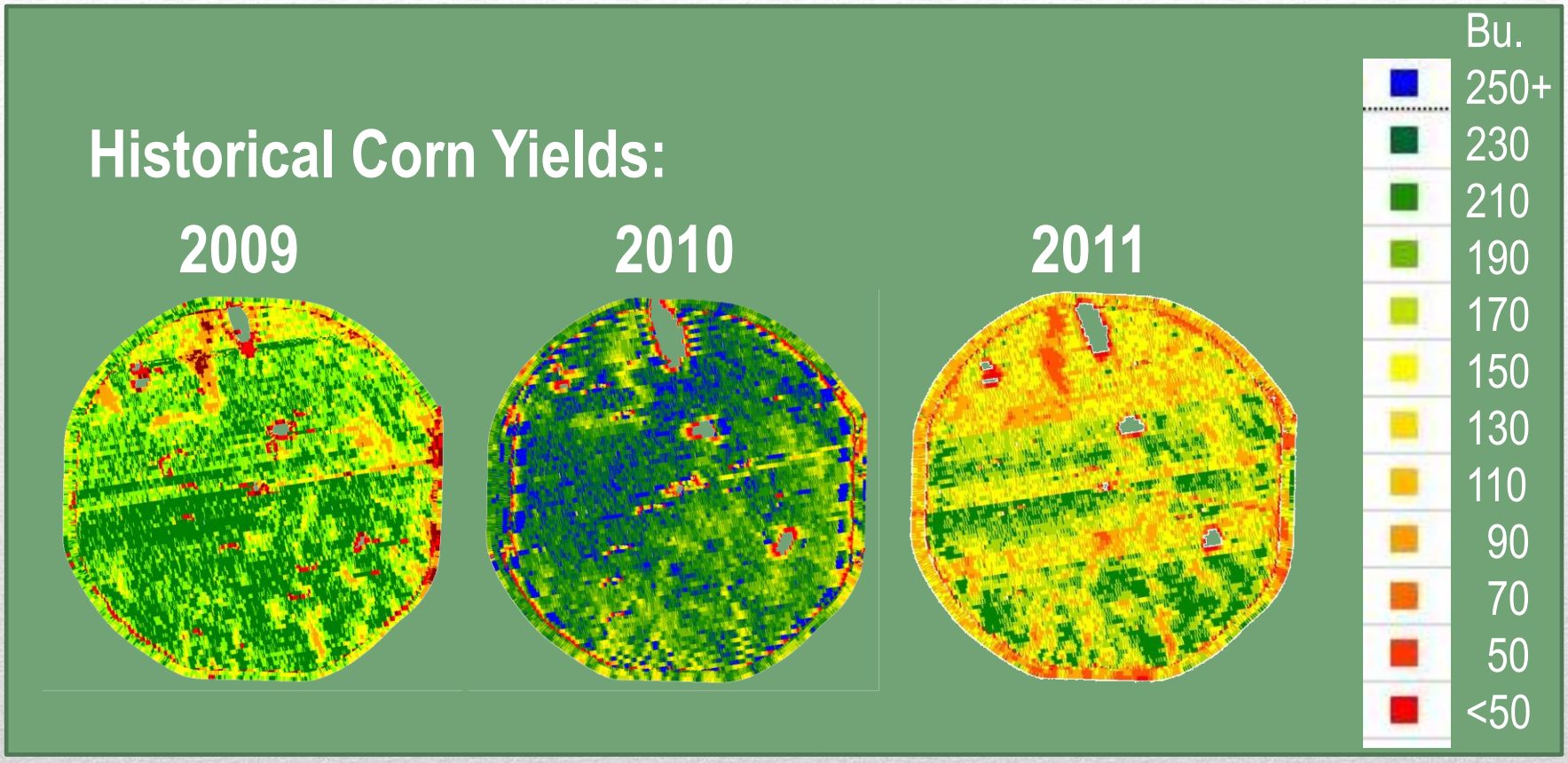
- Swath control
- Rate control
- Site specific chemicals

Step 4: Implementation

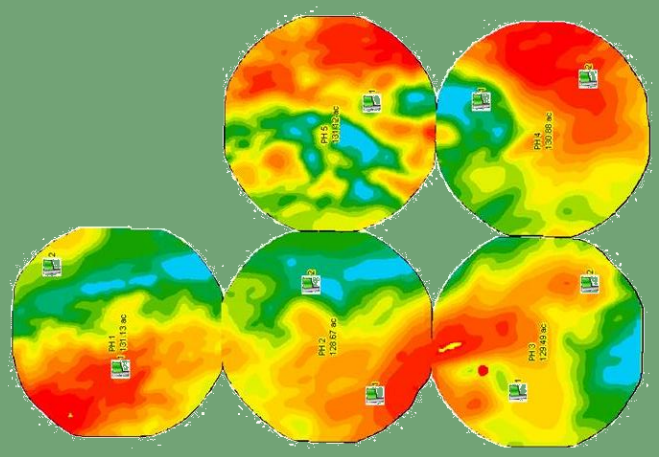
Harvest

- Yield and moisture monitor
- Seed variety locator --
- Autotrac guidance

Step 4: Implementation



Step 5: Analyzing the Results



WATER SAVINGS

Precision agriculture can help you save water and reduce energy costs

Reduce Evaporation

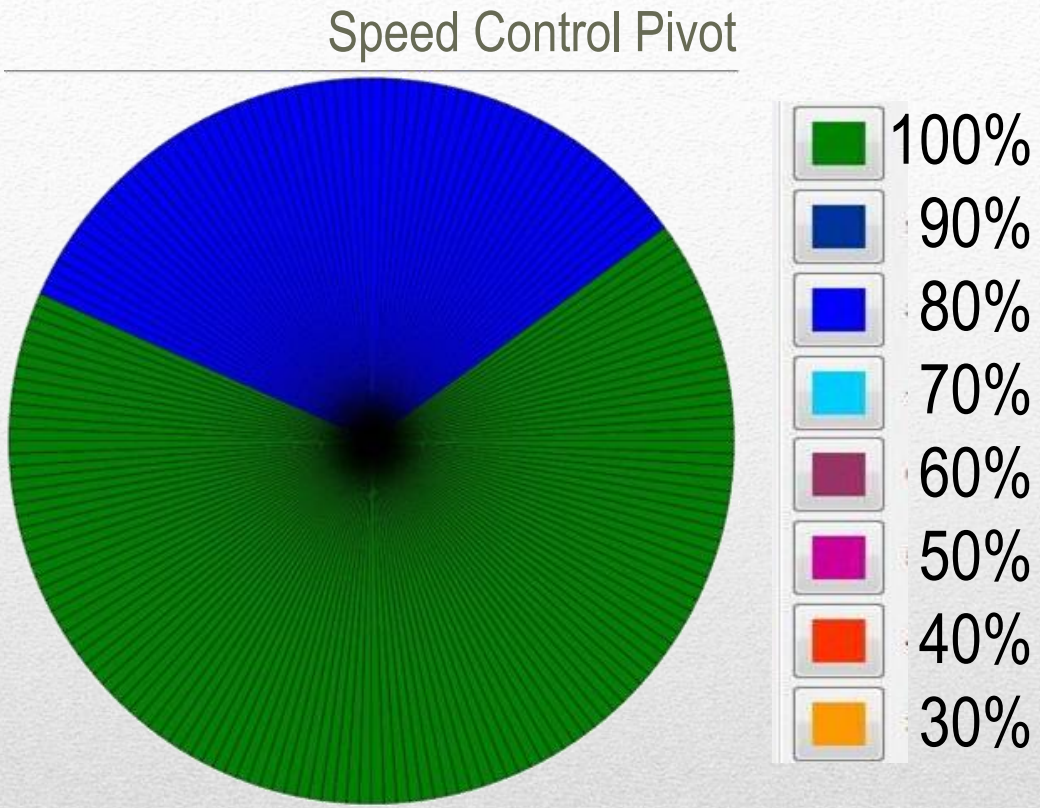
- Strip tillage leaves residue that acts like a sponge reducing evaporation

- Sub-surface drip irrigation delivers water and nutrients directly to the root zone

Reduce Evaporation

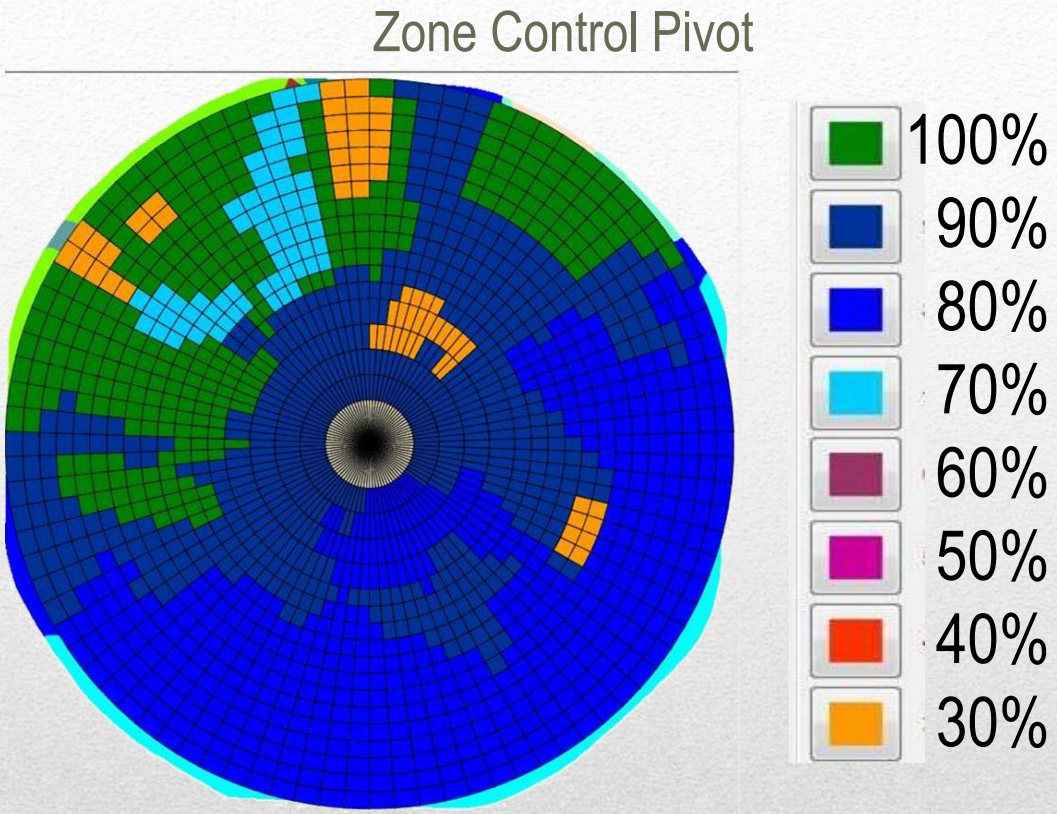
Reduce Water Pumped

- By speeding up or slowing down the pivot you can apply less water to marginal areas and more to your best acres



Reduce Water Pumped

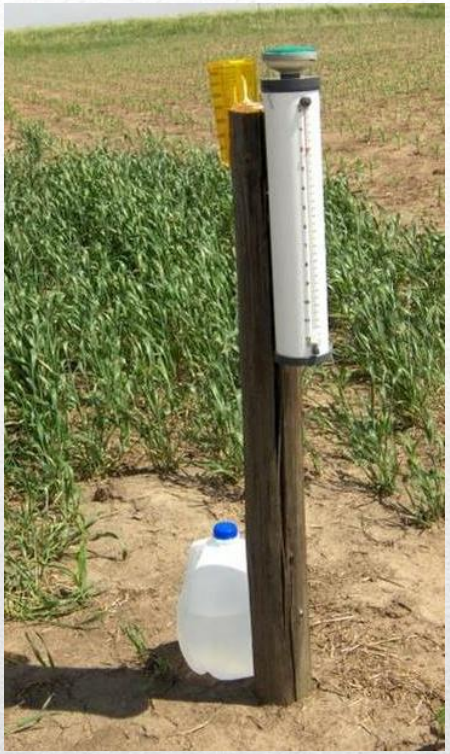
- Pivot nozzles use GPS mapping to adjust amount of water applied on certain soils or for particular seed varieties



Reduce Water Pumped

- ET Gauges and Moisture Probes help determine exactly how much water the plant needs to avoid overwatering.

ET Gauge



Moisture Probe

Traditional Comparisions

* Integrate and evaluate traditional mechanical meters and ultrasonic flow meters and power line carrier (PLC) through power districts

Water Use Per Year

		Acre Inches Pumped				Flow Meter	
Field	NRD	2008	2009	2010	2011	Crop	2011
152 A	MRNRD	11.1	10.3	11.7	7.8	Black	7.58
255 A	MRNRD	8.1	10.7	11.1	7.1	Black	7.09
76 A	MRNRD	7.5	4.8	8.9	7.3	Black	6.78
135 A	MRNRD	11.0	1.3	2.7	10.0	Corn	10.71
128 A	URNRD	9.4	4.76	12.96	10.07	Corn	8.75
130 A	URNRD	10.45	4.52	9.49	7.01	Corn	6.54

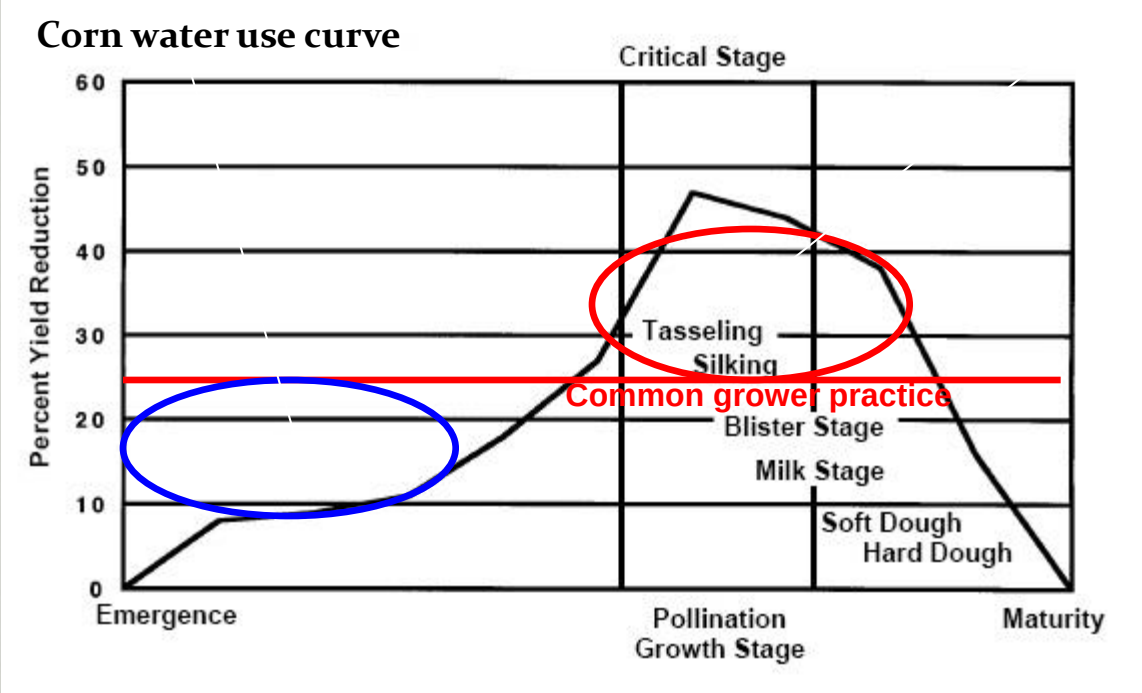
Strategic Irrigation Management

Over Irrigation

- Poor root structure
- Less able to handle stress

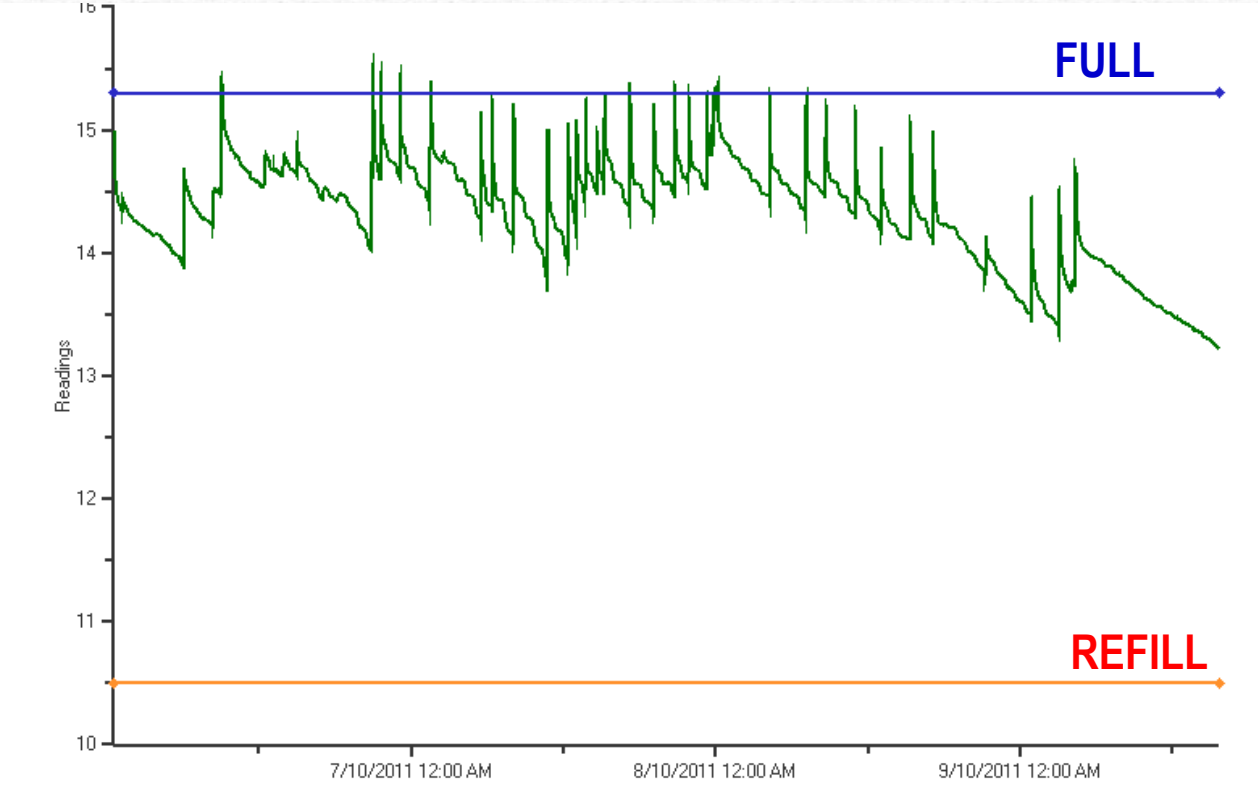
Under Irrigation

- Potential Yield loss
- Poor quality



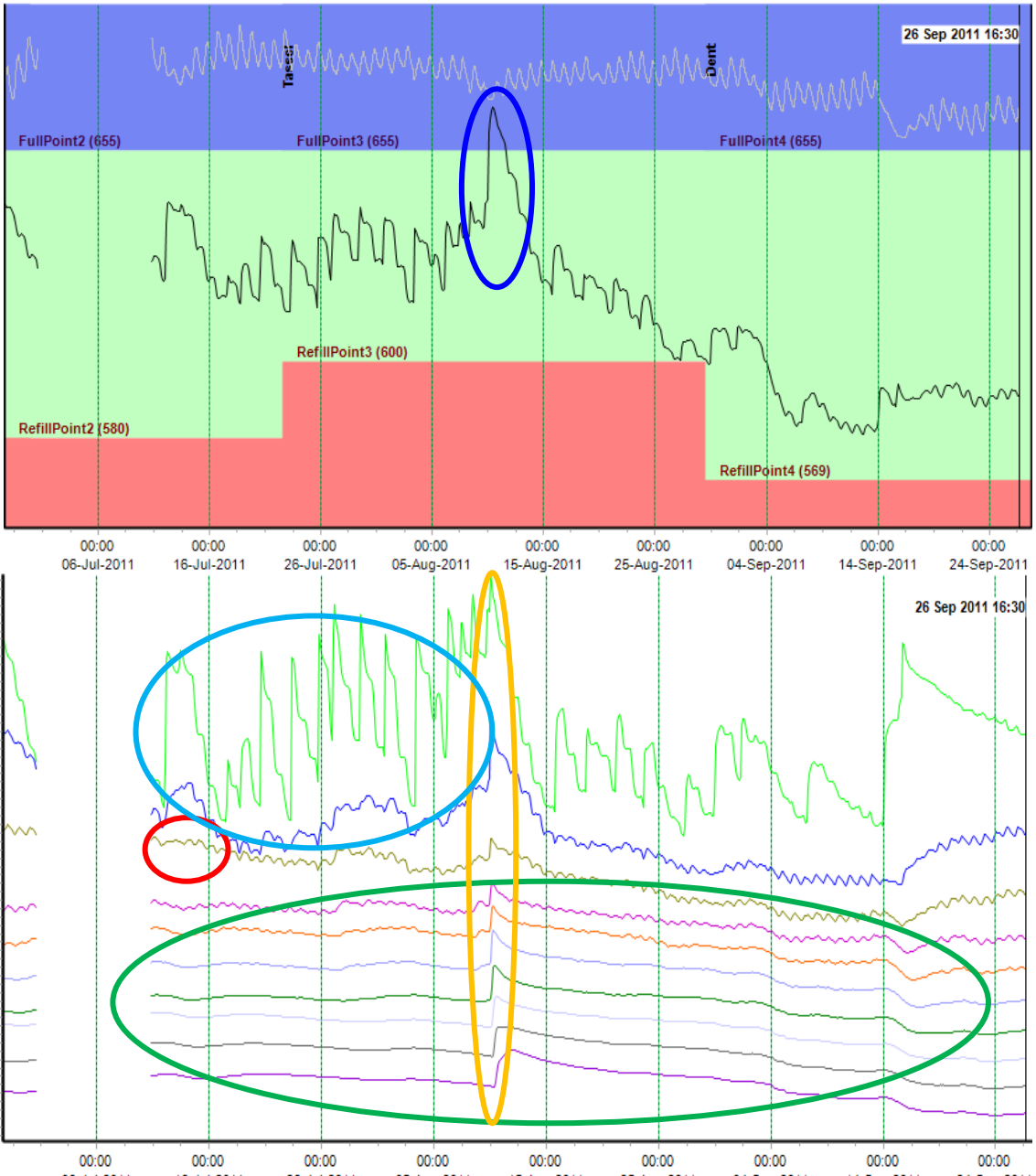
By overwatering in the early part of the season, the plant root system does not develop adequately to keep up with water use requirements during peak demand.

- Tendency to keep fields too wet



Reduce Water Pumped

NE-Roric Paulman-PH 5-Corn



- Season started out with full moisture profile due to early rains.
- Water uptake only down to 12” on July 14.
- 40” deep rain on Aug 9-10 filled profile.
- Frequent irrigations, mostly to 4-8”, kept up with crop demand, but did not allow deep root activity. Could have saved 2-3 irrigations in July. Slow pivot down & less frequently.
- Subsurface moisture was not well utilized .
- Possible leaching of nutrients from Aug 10 rain.

Irrigation Reccommendations | Alarms & Notifications

FIELD NAME	PROBE ID	%STATUS	IRRI REC	ETO	DPD VOL%	PDR	LAST UPDATE	4-DAY DEMAND
JQ 7A	8520	55	1.5"	0.33	0.45	1.363	26/01/12 15:00	27 28 29 30
JQ 5B	9231	22	1.93"	0.33	0.32	0.969	26/01/12 14:00	27 28 29 30
JQ 3C	7896	-2	2.43"	0.33	0.86	2.606	26/01/12 14:00	27 28 29 30
JQ 4A	20145	102	NA	0.33	0.43	1.303	26/01/12 14:00	27 28 29 30
JQ 5A	50126	77	0.73"	0.33	0.29	0.878	26/01/12 14:00	27 28 29 30
JQ 7A	8520	55	1.5"	0.33	0.45	1.363	26/01/12 15:00	27 28 29 30
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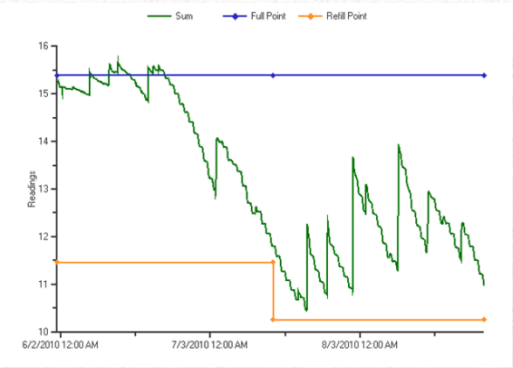
JQ 5A	50126	77	0.73"	0.33	0.29	0.878	26/01/12 14:00	27 28 29 30

Reduce Water Pumped

2010 AquaView by Fontanelle Project Results:

- 500 moisture probes
- Saving $4500+ per pivot
- Increasing yields over 5.5 bu/A
- Saving over 2 inches of water
- Over 1,000,000 acres

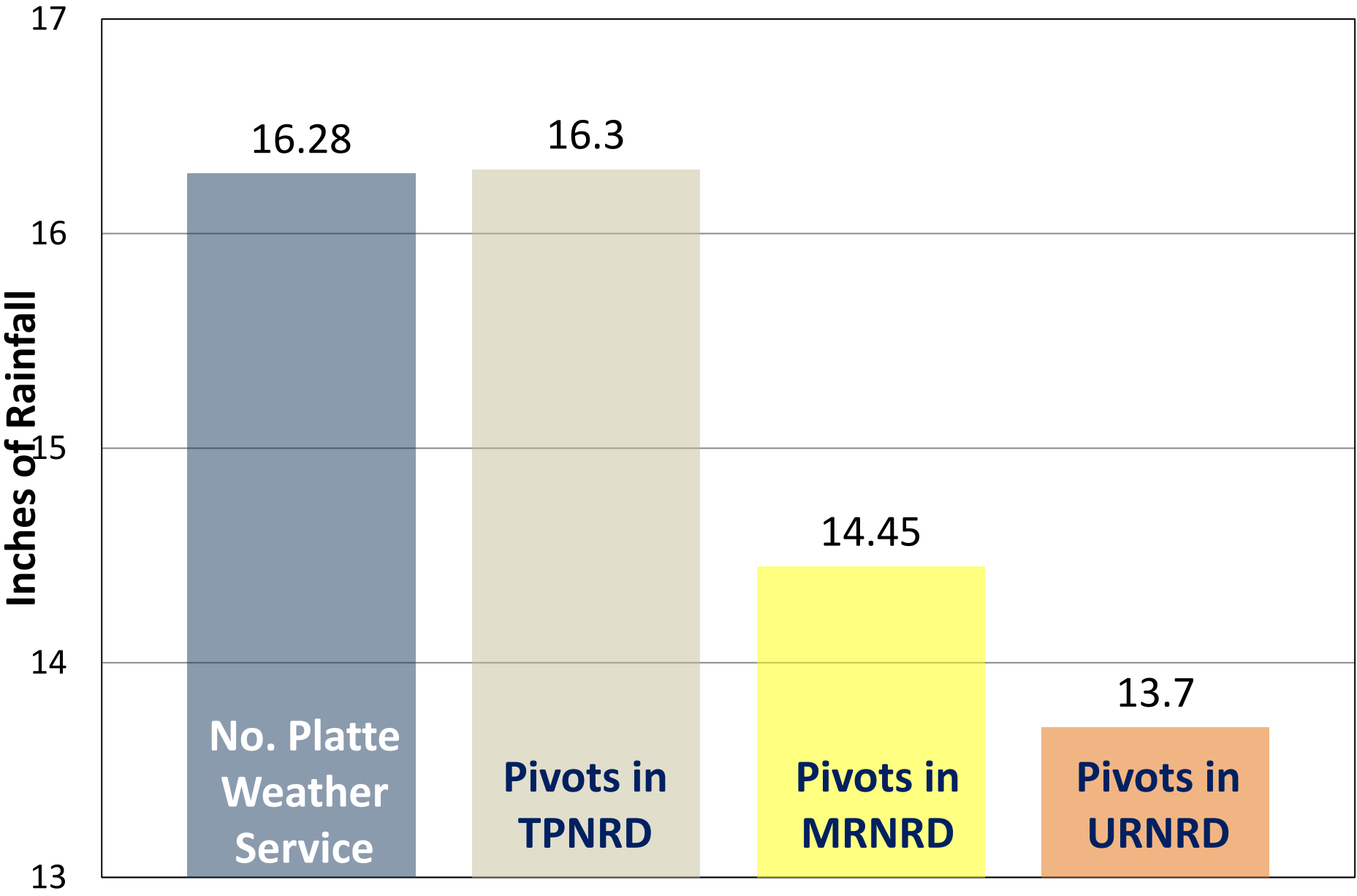


- University of Nebraska study in 2007 and 2008 showed that growers using moisture probes could cut their water applications by 40% and not significantly affect yields.

Suat Irmak
UNL Water Center

Reduce Water Pumped

Comparison of Rainfall Data (May-Sept)



Average water use per crop type from ‘01-’11

	Blacks	Corn	Wheat	Soy	Popcorn
Average	8.13”	16.46”	9.78”	14.79”	12.79”
# of fields	1	7	4	5	4
Range		11.2”-23.81”	5.23”-15.13”	11.56”-19.68”	7.34”-21.57”

Haugland Wheat Dryland Stubble

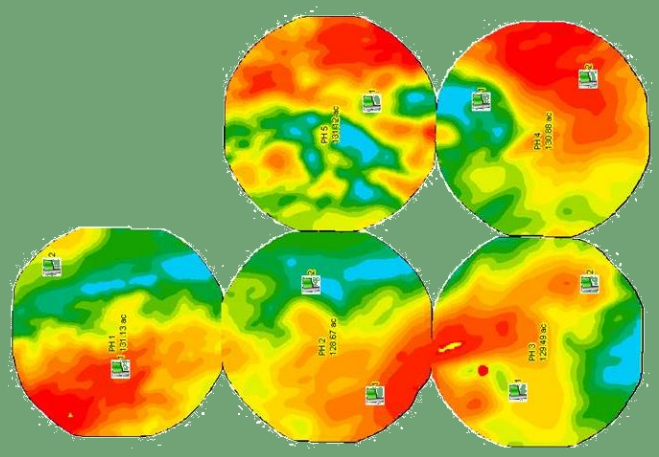
Summed Season View

5/9/11 to current

AquaCheck Classic

PH1 Dryland Grass

Summed Season View



WATER FOR THE FUTURE

Not only can we save on water costs –

We can build a legacy of water for future generations

2013 Water for Generations

"Real Time" Demonstration Project

Testing technologies that offer real time data on:

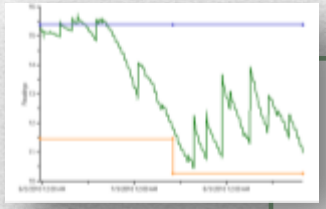
- **Water the crop is using**
- **Water being pumped**
- **Water in soil profile**

Weather Stations –

Tracking precipitation, relative humidity, temperature, wind

Pumping Data

Continuous pumping data on pivots with flow meters or calculated with pressure transducers and ultrasonic flow meters. Compare to power company readings.



Moisture Probes

Real time reporting of moisture levels and movement of water in the soil.

Remote Pivot Controllers

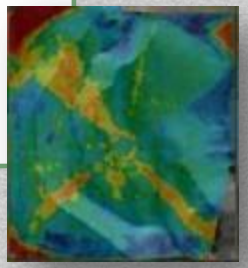
Transmit real time data to phone, computer, iPad for 24-7 access

Soil Samples

Track nitrogen movement and how roots use water in soil

Satellite imagery

Match images with tissue samples. Possibilities for watershed management.



2013 Water for Generations

"Real Time" Demonstration Project

Power Companies
Midwest Electric Coop
Dawson Public Power
Wheatbelt Public Power
Roosevelt Public Power
McCook Public Power
Southern Public Power
Central NE PPID
Tri-State G & T

Growers
11 pivots from Holdrege to Mitchell

Crop Consultants
Olsen Agricultural Labs
Simplot Soil Builders
Appel Consulting
Johnson Consulting
Collins Consulting
Carter Ag Services
Hodge Consulting
Waitley Consulting

Equipment Vendors
Earth Tec Solutions
Aqua Check
21st Century Equip. (John Deere)
Fontanelle/Aquaview
Winfield Solutions
AgSense
Pessl

Partnering to Test Promising Real Time Strategies

NRCS
North Platte, Curtis, Imperial

University
UNL Panhandle Research and Extension

Natural Resource Districts
Middle Republican NRD
Upper Republican NRD
North Platte NRD
Twin Platte NRD

2013 Water for Generations

30/30 Grower Behavior Study

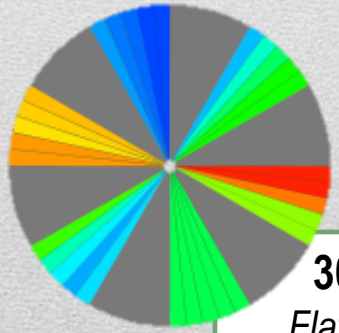
This study gives growers an opportunity to experience how variable rate irrigation can be used to reduce overwatering and energy costs.

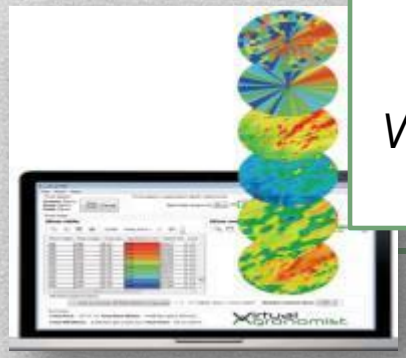
Map water holding capacity

EM mapping of soil densities.

Equip pivot with variable speed control

To apply different rates of water – slow over light soils, faster over heavy soils.





Live data to growers

Virtual Optimizer website

30/30 irrigation prescription

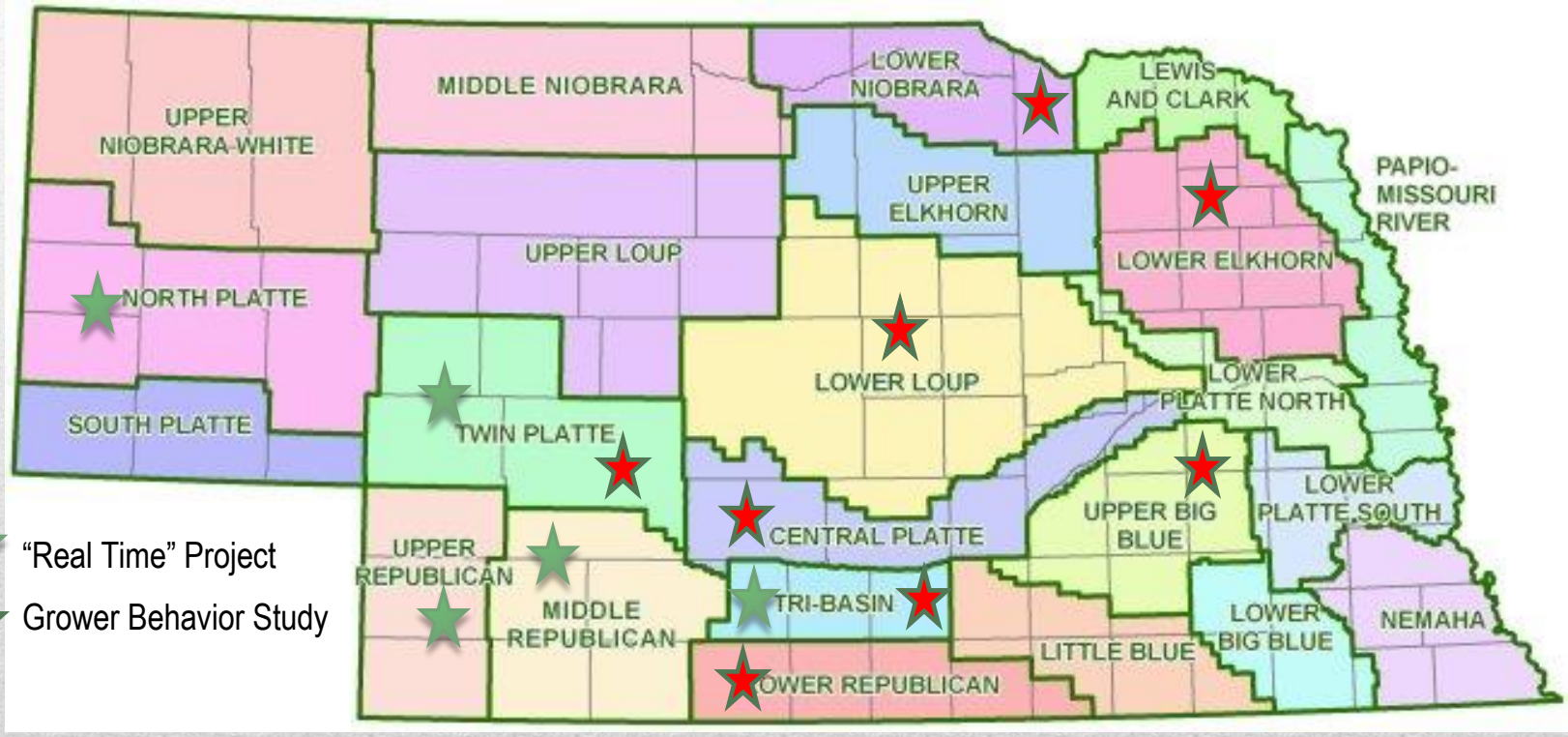
Flat rate irrigation on grower sectors.

Variable rate prescription on study sectors.

Apply 10% less water in study sectors.

2013 Water for Generations Projects

In 12 NRD Districts



Perkins County 2005 management study

Perkins County 2005 Consumption			
Land use type	**Acres**	**Consumption/acre (Annual Inches)**	**Annual Consumption (AF)**
Barren	757	19.0	1,199
Dryland Alfalfa	12,568	19.6	20,528
Dryland Corn	**29,991**	17.8	**44,487**
Dryland Dry Edible Beans	8,366	16.0	11,155
Dryland Small Grains	**76,432**	15.2	**96,814**
Dryland Sorghum	799	17.5	1,165
Dryland Soybeans	839	16.6	1,161
Dryland Sunflower	6,807	16.7	9,473
Irrigated Alfalfa	6,939	45.0	26,021
Irrigated Corn	**102,124**	29.5	**251,055**
Irrigated Dry Edible Beans	8,820	23.0	16,905
Irrigated Potatoes	589	29.0	1,423
Irrigated Small Grains	5,607	27.2	12,709
Irrigated Sorghum (Milo, Sudan)	1,834	30.0	4,585
Irrigated Soybeans	8,501	27.9	19,765
Irrigated Sugar Beets	1,911	33.3	5,303
Irrigated Sunflower	2,737	23.9	5,451
Open Water	100	48.0	400
Other Agricultural Land	477	16.6	660
Range, Pasture, Grass	**305,519**	19.2	**488,830**
Riparian Forest and Woodlands	1,182	54.6	5,378
Roads	797	19.0	1,262
Summer Fallow	**93,441**	15.1	**117,580**
Urban Land	1,067	19.7	1,751
Wetlands	2,315	57.0	10,994
Significant (Top 5)	**607,507**		**998,766**
Total	680,518	na	1,156,053

CRP land is included in range, pasture and grass lands. 343217 (AF) or 29% is irrigated portion of total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